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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/608,152 | 06/30/2003 | Hakansson Bo | ANO 6444 US/1275 | 8148 |

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| EXAMINER | |
|---|---|
| WILKINS III, HARRY D | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1795 | |

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| 08/26/2008 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/608,152 | BO ET AL. | |
| | **Examiner** | **Art Unit** | |
| | Harry D. Wilkins, III | 1795 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *24 July 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-12 and 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 24 July 2008 has been entered.

### *Status*

2. In view of a lack of a direct teaching in Wanngard of formation of chlorate in the divided electrolytic cell, the rejection grounds based on Wanngard are being withdrawn in view of Applicant’s amendment to claim requiring formation of chlorate in the divided electrolytic cell. However, in view of the teachings of Cook, Jr, one of ordinary skill in the art would have expected the divided electrolytic cell of Wanngard to inherently produce at least some chlorate ions. See the new rejection grounds below.

### *Claim Rejections - 35 USC § 103*

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1-5, 7, 9-11 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cook, Jr. (US 3,897,320) in view of Oda et al (US 4,299,682).

Cook, Jr. teaches (see abstract, figure and col. 1, line 52 to col. 2, line 39) a process of making alkali metal chlorate including the steps of introducing an electrolyte

solution containing alkali metal chloride into the anode compartment (27) of a divided electrolytic cell (11), electrolyzing the electrolyte solution to produce alkali metal chlorate in an electrolyzed solution in the anode compartment, forming alkali metal hydroxide in the cathode compartment (29), and transferring the electrolyzed solution from the anode compartment to a chlorate reactor (35) to react the electrolyzed solution further to produce a concentrated alkali metal chlorate electrolyte.

Thus, Cook, Jr. do not teach using a gas diffusion cathode in the divided electrolytic cell and feeding oxygen gas to the gas diffusion cathode.

Oda et al teach (see abstract, figure 2, col. 1 and col. 4, line 30-col. 6, line 5) that in divided electrolytic cells for the electrolytic production of $Cl_2$ and NaOH, the operating voltage of the cell can be reduced by using a gas diffusion cathode, and feeding oxygen to the cathode through a gas chamber (9).

Therefore, it would have been obvious to one of ordinary skill in the art to have used the gas diffusion cathode as taught by Oda et al in the divided electrolysis cell taught by Cook, Jr. because of decreased operating voltage which leads to an increased current efficiency.

It is noted that the overall reaction provided by the process cell of Oda et al is identical to the reaction provided by the process of Cook, Jr. Both cells react an incoming NaCl anolyte and NaOH catholyte to produce $Cl_2$ gas at the anode and additional NaOH at the cathode. The $Cl_2$ of Cook, Jr. immediately dissolves into the solvent (water) to form HClO and HCl. Additionally, the membrane of Oda et al would have permitted a small amount of the hydroxide ions to cross, similarly to Cook, Jr,

resulting in the formation of at least some chlorate ions in the anode chamber. Therefore, one of ordinary skill in the art would have had a reasonable expectation of successfully substituting the gas diffusion electrode of Oda et al into the cell of Cook, Jr.

Regarding claim 2, Oda et al teach (as above, figure 2) that the gas diffusion electrode divided the cathode compartment into a gas chamber (9) on one side of the gas diffusion electrode and an alkali metal hydroxide chamber (7) on the other side thereof. An alkali metal solution was introduced to the alkali metal hydroxide chamber at 12 and an oxygen containing gas was introduced to the gas chamber at 14.

Regarding claim 3, Oda et al teach (as above) using a cation selective membrane.

Regarding claim 4, Cook, Jr. teaches (see abstract and col. 3) using a pH of the solution of 2-6.

Regarding claim 5, Cook, Jr. teaches (see col. 3) a chloride concentration of 200-320 g/l.

Regarding claim 7, Cook, Jr. teaches (see col. 3) that the recycled electrolyte from the crystallizer (61) is not free of chlorate ions and that the chlorate was present at an amount smaller than the chloride in the recycled electrolyte which was 50-100 g/L. Thus, the recycled electrolyte, ultimately fed into the divided electrolytic cell after saturation with sodium chloride would have contained the claimed amount of chlorate ions.

Regarding claim 9, Cook, Jr. does not teach adding any chromate to the electrolyte.

Regarding claim 10, Cook, Jr teaches (see col. 7, lines 45-48) producing a sodium hydroxide concentration of 250-450 g/L.

Regarding claim 11, Cook, Jr. teaches (see col. 7, lines 17-28) controlling the temperature of the electrolyte to be less than 105°C, most preferably in the range of 65 to 85°C.

Regarding claim 23, the cell of Oda et al included (see figure 2) a gas diffusion electrode (8) which divided the cathode compartment into a gas chamber (9) on one side of the gas diffusion electrode and an alkali metal hydroxide chamber (7) on the other side between the gas diffusion electrode and the cation selective separator. The process of Oda et al included (see Example 1) introducing a weak alkali metal hydroxide solution into the alkali metal hydroxide chamber and oxygen containing gas into the gas chamber. The cation selective separator was a membrane. Cook, Jr teaches (see abstract and col. 3) using a pH of the solution of 2-6.

5. Claims 1-6, 8, 10-12 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wanngard (US 5,419,818) with evidence from Cook, Jr. (US 3,897,320) in view of Oda et al (US 4,299,682).

Wanngard teaches (see col. 1, lines 18-37, cols. 3-6) a process for producing alkali metal chlorate in a divided electrolytic cell (12) including electrolyzing the anolyte electrolyte solution and transferring the electrolyzed solution to a chlorate reactor (4 or 5). The cell (12) of Wanngard was preferably divided by a cationic selective membrane.

Wanngard teach that the electrolytic cell (12) is a divided electrolytic cell. In this process, the anolyte fed to the cell included NaCl and the catholyte included NaOH.

The anolyte was electrolyzed to generate $Cl_2$ gas at the anode and the catholyte was electrolyzed to generate NaOH at the cathode. The $Cl_2$ was immediately hydrolyzed into HClO and HCl (Wanngard at col. 3, lines 59-68). The HClO is then reacted in the chlorate reactor to form sodium chlorate ($NaClO_3$).

Wanngard fails to teach the production of any chlorate within the divided electrolytic cell. However, it was known to one of ordinary skill in the art that any hydroxide ions crossing the membrane in a divided electrolytic cell would react with the hypochlorite ions ($ClO^-$) to cause formation of chlorate ions ($ClO^{-3}$). Evidence of this knowledge can be seen in Cook, Jr. at col. 2, lines 5-26, which states that cation-active permselective membranes allow some hydroxyl ions to migrate through from catholyte to anolyte. The hydroxyl ions then react in the anolyte to produce chlorate. Thus, in the process of Wanngard, at least some chlorate ions were produced in the anode compartment of the divided electrolytic cell.

Thus, Wanngard fails to teach the claimed cell which had a gas diffusion cathode and feeding oxygen to the gas diffusion cathode.

Oda et al teach (see abstract, figure 2, col. 1 and col. 4, line 30-col. 6, line 5) that in divided electrolytic cells for the electrolytic production of $Cl_2$ and NaOH, the operating voltage of the cell can be reduced by using a gas diffusion cathode, and feeding oxygen to the cathode through a gas chamber 9.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the gas diffusion cathode as taught by Oda et al in the divided electrolysis cell

taught by Wanngard because of decreased operating voltage which lead to an increased current efficiency.

It is noted that the overall reaction provided by the process cell of Oda et al is identical to the reaction provided by the process of Wanngard. Both cells react an incoming NaCl anolyte and NaOH catholyte to produce $Cl_2$ gas at the anode and additional NaOH at the cathode. The $Cl_2$ of Wanngard immediately dissolves into the solvent (water) to form HClO and HCl. Additionally, the membranes of Wanngard and Oda et al would have permitted a small amount of the hydroxide ions to cross, similarly to Cook, Jr, resulting in the formation of at least some chlorate ions in the anode chamber. Therefore, one of ordinary skill in the art would have had a reasonable expectation of successfully substituting the gas diffusion electrode of Oda et al into the cell of Wanngard.

Regarding claim 2, Oda et al teach (as above, figure 2) that the gas diffusion electrode divided the cathode compartment into a gas chamber (9) on one side of the gas diffusion electrode and an alkali metal hydroxide chamber (7) on the other side thereof. An alkali metal solution was introduced to the alkali metal hydroxide chamber at 12 and an oxygen containing gas was introduced to the gas chamber at 14.

Regarding claim 3, Oda et al teach (as above) using a cation selective membrane.

Regarding claims 4-6 and 11, Wanngard teaches (see col. 6) using a pH of the solution of 5.5-6.5, a chloride concentration of 100-140 g/l, a chlorate concentration of 500-650 g/l and a temperature of 50-100°C.

Regarding claim 8, Wanngard teaches (see col. 7, lines 5-8) using a minor addition of sodium chromate. It would have been obvious to one of ordinary skill in the art to have optimized the amount of chromate used.

Regarding claim 10, Wanngard does not disclose a concentration of sodium hydroxide in the catholyte. However, it would have been obvious to one of ordinary skill in the art to have optimized the concentration of the hydroxide being produced in the electrolyzer in order to achieve proper reaction rate.

Regarding claim 12, Wanngard teaches feeding both the electrolyzed anolyte and the electrolyzed catholyte to the chlorate reactor (4).

Regarding claim 23, the cell of Oda et al included (see figure 2) a gas diffusion electrode (8) which divided the cathode compartment into a gas chamber (9) on one side of the gas diffusion electrode and an alkali metal hydroxide chamber (7) on the other side between the gas diffusion electrode and the cation selective separator. The process of Oda et al included (see Example 1) introducing a weak alkali metal hydroxide solution into the alkali metal hydroxide chamber and oxygen containing gas into the gas chamber. The cation selective separator was a membrane. Wanngard teaches (see cols. 3-4) using a pH of the solution of 5.0-7.5.

***Response to Arguments***

6. Applicant's arguments, see page 6, filed 24 July 2008, with respect to the fact that Wanngard does not teach the production of any chlorate ions inside the anode chamber have been fully considered and are persuasive. However, as above, new

evidence has been found to show that the divided electrolytic cell of Wanngard inherently produced at least some chlorate ions in the anode chamber.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on 571-272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Harry D Wilkins, III/
Primary Examiner, Art Unit 1795

hdw